

2014 THWI Abstracts for Funded Projects

(Summary Below)

1. Determinations of the Currently Unknown Composition and Structure of Algae Assemblages in Middle Tennessee Streams Needed to Document and Monitor the Effects of Water Quality

Austin Peay State University- Dr. Jeff Lebkuecher

Assessments of stream biology that characterize and quantify the impacts of nutrient enrichment are prerequisites to developing watershed management plans designed to improve the integrity of nutrient-impaired waters. Algae are the most diverse group of all organisms and the ecological base of aquatic systems. Unlike the fauna and other flora of Tennessee watersheds, the composition and structure of algae assemblages in Tennessee rivers are unknown. This astonishing lack of basic knowledge of diversity limits the ability of watershed managers to measure and monitor the impacts of pollution. A single stream reach often includes over 100 algae species. This work will determine the diversity and structure of algae assemblages essential to understand and monitor the effects of water quality. The goal of this project is to provide watershed managers with the composition and structure of algae assemblages in Middle Tennessee essential to understand and monitor the effects of water quality on ecological integrity. Ten stream reaches in 10 different HUC 8 watersheds in the Interior Plateau Level III Ecoregion of Middle Tennessee will be sampled during the spring and summer yielding a description of 20 algae assemblages. The stream reaches sampled will include those listed on the 303d list and reference sites. Concentrations of soluble reactive phosphorous and total nitrogen will be determined from water samples collected spring and summer from the 10 stream reaches. A Pearson's correlation coefficient for the percent composition of each species to the concentration of soluble reactive phosphorous and total nitrogen will be determined to demonstrate the relationship of phosphorous and nitrogen concentrations on the abundance of hundreds of species. The biomass of lotic photoautotrophic periphyton is limited by the concentration of soluble reactive phosphorous. The Algae Trophic Index of soft-algae assemblages will be calculated for each of the 20 assemblages to demonstrate the effect of phosphorous concentration on the structure of algae assemblages.

2. Clinch Powell Clean Rivers Initiative-Enhancing Multi-Agency Coordination for Conservation Impacts Phase II

The Nature Conservancy, Virginia Chapter- Ronald Lambert

The Clinch Powell Clean Rivers Initiative (CPCRI) is an ambitious two-state river coalition focused on sustaining and improving water quality and river health for the people of southwest Virginia and northeast Tennessee. TNC chairs the initiative, which currently engages leaders from state (TDEC, TWRA, and TVA) and federal agencies (USFWS, EPA Regions III and IV, USGS, and the US Office of Surface Mining), respected research scientists, conservation organizations, local officials, and leaders of industry. The Tennessee portion of the Lower Powell River watershed highlighted in this project is a generally rural area. Agricultural production comprises the dominant land use and is the largest

contributor to nonpoint source pollution. Due to the loss of the vegetation and their vital root systems, the riverbanks are eroding actively, contributing tons of sediment to the river annually, robbing landowners of valuable, productive soil and increasing treatment costs for the local water utility. A cutting edge landscape analysis will be completed to prioritize tracts of land to implement a volunteer landowner BMP Program. We will also be combining these BMP funds along with the buffer incentive program in conjunction with other existing Farm Bill programs to establish additional Best Management Practices where necessary to complete the holistic approach to farm nonpoint source pollution abatement and watershed protection. In this project, the Conservancy proposes to work with a wide array of Tennessee partners to complete for future conservation investments and establish a common set of priorities for agencies working in the Powell River system.

The proposed Clinch River BMP and Buffer Incentive Program is designed to directly address sedimentation impacts and provide *a new financial benefit* to landowners willing to establish vegetated riparian buffers. Existing agricultural assistance programs which have focused mainly on cattle exclusion have failed to provide funding sufficient to entice landowners to change their decades-old practices along stream banks. The result is that riverbank erosion continues to get worse. Due to the small acreage of the farms and the narrowness of the natural terrace along the riverbank, a reasonable per acre payment will be necessary to truly incentivize the establishment of riparian buffers. Several landowners have been contacted regarding the feasibility of our proposed buffer incentive idea and have responded favorably. We will also be working with partners to have “farm days”, an opportunity to bring community members together to learn and share progress.

3. Regenerative Stormwater Conveyances: An Innovative Watershed Management Tool for Tennessee

University of Tennessee Knoxville- Dr. Jon Hathaway

As streams become incised over time due to the influence of urbanization on geomorphology, stormwater outfalls which were once level with the stream become perched high above, causing substantial erosion along the stream bank. Concurrently, degradation due to stormwater runoff is an ever increasing issue in Tennessee. Regenerative Stormwater Conveyances (RSCs) are an innovative approach to repairing bank erosion from stormwater outfalls while treating stormwater runoff through filtration, infiltration, microbial action, and sedimentation. RSCs have a dual function, allowing small storms to infiltrate and travel through the system as shallow groundwater flow, and large storms to travel through a series of step pools to dissipate energy and reduce erosive flows. RSCs are becoming increasingly common in the mid-Atlantic, becoming part of the overall strategy to restore Chesapeake Bay. As no RSCs (to the applicant’s knowledge) have been installed in Tennessee, the intent of this study is to install and monitor two RSCs to establish performance thresholds. The RSCs will act as demonstration sites, as a retrofit restoration project for a degraded watershed, and will be utilized for monitoring and research.

4. Enhancing widespread water quantity and quality control through implementation and dissemination of the Tennessee Runoff Reduction Assessment Tool (RRAT) to assist in the design and evaluation of runoff reduction Low Impact Development (LID) practices

University of Tennessee Knoxville- Dr. Andrea Ludwig

Mimicking natural hydrology to enhance water quality and preserve water quantity is a primary goal for state-permitted urbanizing areas, which includes over 90 Tennessee communities. A state-driven support program was initiated in 2012 to build the skills of designers and local program managers in green infrastructure design. Through this collaborative initiative, the Runoff Reduction Assessment Tool (RRAT) was developed by the University of Tennessee Stormwater Management, Assistance, Research, and Training (SMART) Center with the assistance of an external stakeholder committee comprised of experts from all sectors of the design community. The RRAT is a process-based model used to determine the runoff reduction effectiveness of proposed designs, as well as whether those meet state runoff reduction requirements. While the tool will be completed in mid-2014, ongoing support and updates associated with implementation are not in the scope of the state's current program. We request support through the Tennessee Healthy Watershed Initiative to provide technical support and updates to the RRAT for the design community across the state. This will allow expanded application of good science to practice design, ultimately enhancing watershed hydrology and water quality.

5. Bailey Fork Creek Floodplain Restoration to Reduce Valley-Plug Expansion and Restore Bottomland Hardwood Forests

West Tennessee River Basin Authority- David Blackwood

Channelization of West TN rivers has severely degraded many ecosystems and created landuser conflict. Channel incision and subsequent valley-plugging (due to increased sediment supply) is a common problem that has negatively affected the health of our streams and bottomland hardwood forests by filling stream channels with sediment and causing permanently flooding that results in large forest mortality. Valley-plugged streams have been successful restored by the West Tennessee River Basin Authority by restoring stream channels and reconnecting them to their floodplains. These restoration projects closely mimic natural conditions that provide sediment storage and improve hydrologic functions important to stream and bottomland forest health. Funding received from THWI will be used to restore 4,600 linear feet of stream channel and to reconnect and restore 28 acres of bottomland forest habitat in Bailey Fork Creek. This project is part of a larger strategy to restore a large section of Bailey Fork Creek with degraded bottomland forests caused by severe valley-plugging. Completion of this project is a first-step to improve the ecological health of this watershed and to reduce excessive flooding that causes landuser conflict.

| Project Title | | Strategic Investment Areas & Location | Goals and Objectives | Funding | In-kind Leverage | Total Partners |
|---------------|-------------------------|--|--|-----------|------------------|----------------|
| 1 | Algae Assemblages | Research & Education - Middle TN Methods Applicable throughout TN | <ol style="list-style-type: none"> 1. Lists of taxa that document the diversity of algae 2. Lists of the percent composition of each species at each along with the concentration of soluble reactive phosphorous and total nitrogen. 3. List of Pearson's correlation coefficients to demonstrate the relationship of phosphorus and nitrogen concentration to the abundance of hundreds of algae species. 4. List of species which can be used as indicator species. 5. Values for the Algae Trophic Index for stream reaches which will illustrate the impact of phosphorous concentration on algae assemblages highlighting those reaches which should be targeted for habitat improvement. 6. Education and Results sharing in classes at APSU, 2 Seminars, 3 Educational forums for Project WET, 4 presentations at scientific meetings. | \$20,000 | \$7,443 | 5 |
| 2 | Clinch Powell | Protection, Restoration, and Education - East TN, Lower Powell Watershed | <ol style="list-style-type: none"> 1. Voluntary Landowner BMP Program ~ (10) landowner visits, (6) farm management plans, (6) BMP projects 2. Tract-level GIS model 3. Long Term Riparian Area Protection ~ (30) acres of riparian area enrolled into 10 year incentives program. 4. Education/Outreach | \$100,000 | \$166,500 | 9 |
| 3 | Regenerative Stormwater | Research, Restoration, Identification & Exportation of BMPs, | <ol style="list-style-type: none"> 1. Design and construct RSCs to address erosion within an EPA 303d listed watershed while providing hydrologic and water quality benefits. 2. Monitor hydrology and water quality at the inlet and | \$113,000 | \$168,338 | 5 |

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|--------------|--------------------------|--|--|------------------|------------------|-----------|
| | Conveyances | and Education- East TN, Beaver Creek Watershed | outlet of the RSC to establish system performance. 3. Disseminate design, construction, and performance knowledge of RSCs to academics, private consultants, and regulators in Tennessee. | | | |
| | | Results Applicable Throughout | | | | |
| 4 | RRAT implementation | Education and Exportation Throughout TN | 1. Continue enhancing the functionality of the RRAT, providing the best possible science and ease of use for broad distribution to the stormwater management community. 2. Further enhance RRAT usefulness by developing mechanisms to ease delivery of the results by designers and review by designated plan reviewers and the general public. 3. Develop informational and training materials and sessions for the broadest possible range of audiences, from high school science students through graduate students and licensed engineers and landscape architects. | \$90,000 | \$30,002 | 5 |
| 5 | Bailey Creek Restoration | Restoration and Monitoring-West TN | 1. 4,600 linear feet of meandering stream channel restored. 2. 28 acres of wetland vegetation and associated hardwood communities. 3. A monitoring report assessing the physical effects of the restoration on system stability as well as information on flood peak and timing, will be completed one year after start of the monitoring period. Additionally, the report will document the successful reestablishment of native wetland vegetation and bottomland hardwood forest. | \$135,000 | \$155,000 | 3 |
| TOTAL | | | | \$458,000 | \$527,283 | 27 |